This is a digital copy of a book that was preserved for generations on library shelves before it was carefully scanned by Google as part of a project to make the world's books discoverable online.

It has survived long enough for the copyright to expire and the book to enter the public domain. A public domain book is one that was never subject to copyright or whose legal copyright term has expired. Whether a book is in the public domain may vary country to country. Public domain books are our gateways to the past, representing a wealth of history, culture and knowledge that's often difficult to discover.

Marks, notations and other marginalia present in the original volume will appear in this file - a reminder of this book's long journey from the publisher to a library and finally to you.

Usage guidelines

Google is proud to partner with libraries to digitize public domain materials and make them widely accessible. Public domain books belong to the public and we are merely their custodians. Nevertheless, this work is expensive, so in order to keep providing this resource, we have taken steps to prevent abuse by commercial parties, including placing technical restrictions on automated querying.

We also ask that you:

+ *Make non-commercial use of the files* We designed Google Book Search for use by individuals, and we request that you use these files for personal, non-commercial purposes.

+ *Refrain from automated querying* Do not send automated queries of any sort to Google's system: If you are conducting research on machine translation, optical character recognition or other areas where access to a large amount of text is helpful, please contact us. We encourage the use of public domain materials for these purposes and may be able to help.

+ *Maintain attribution* The Google "watermark" you see on each file is essential for informing people about this project and helping them find additional materials through Google Book Search. Please do not remove it.

+ *Keep it legal* Whatever your use, remember that you are responsible for ensuring that what you are doing is legal. Do not assume that just because we believe a book is in the public domain for users in the United States, that the work is also in the public domain for users in other countries. Whether a book is still in copyright varies from country to country, and we can't offer guidance on whether any specific use of any specific book is allowed. Please do not assume that a book's appearance in Google Book Search means it can be used in any manner anywhere in the world. Copyright infringement liability can be quite severe.

About Google Book Search

Google's mission is to organize the world's information and to make it universally accessible and useful. Google Book Search helps readers discover the world's books while helping authors and publishers reach new audiences. You can search through the full text of this book on the web at `http://books.google.com/`

THE

ALPHEUS FELCH HISTORICAL LIBRARY

BEQUEATHED
TO THE
UNIVERSITY OF MICHIGAN
BY THE
HON. ALPHEUS FELCH.
1896.

QB
224
.D26

REMARKS

UPON THE

ESTABLISHMENT OF AN AMERICAN PRIME MERIDIAN.

BY

CHARLES H. DAVIS,
LIEUTENANT U. S. NAVY, SUPERINTENDENT OF THE NAUTICAL ALMANAC.

CAMBRIDGE:
METCALF AND COMPANY,
PRINTERS TO THE UNIVERSITY.
1849.

Released 10-6-37 jm

REMARKS.

By an act, approved March 3, 1849, the Congress of the United States directed the preparation of an American Nautical Almanac. The appropriation for this purpose became available on the 1st of July, and in the course of that month I was ordered to Washington to take charge of the work, and to receive the instructions of the Navy Department concerning its organization.

The selection of a prime meridian for which the calculations of the ephemeris are to be made is a primary question; one that must of necessity be decided before the work of computation can be begun. The Congress of the United States by the act of appropriation originated this question, and it belonged to the position assigned me of Superintendent of the Almanac to meet it, and to treat it. But I did not propose to act arbitrarily in this matter. I have not taken advantage of my position to enforce my own opinions, either privately or with unbecoming earnestness. On the contrary, regarding the question as one of common interest, both in its scientific and practical bearings, I proposed to submit it at the earliest moment, and in the most open manner, to general discussion. Accordingly I addressed a communication to the Hon. Wm. Ballard Preston, Secretary of the Navy, who, in his reply, directed me "to bring the subject of an American prime meridian before the American Association for the Advancement of Science, to convene at Cambridge, Mass., on the 14th instant, for the purpose of soliciting the opinions of the principal mathematicians and astronomers upon that highly interesting subject."

As the best mode of presenting the question fully, of suggesting the scientific and practical considerations it involves, and thus of inviting the most full and free expression of the views and reflections of the members of the Association, I read a paper before the Association, the same in substance as my letter to the honorable Secretary, which was referred to a committee consisting of twenty-two members, from various parts of the country. A second paper, opposed to my own, was read by Professor Holton, which was likewise referred to the same committee. It is well known that a memorial has been gotten up in Boston, New York, and elsewhere, under the influence and direction of Mr. J. Ingersoll Bowditch and Mr. George W. Blunt, adverse to the adoption of an American prime meridian, and recommending, therefore, that we should not publish an American Nautical Almanac, but that we should publish a British Nautical Almanac in this country. Several of the letters of the committee recommend, without discrimination, the same thing.

The topic discussed in my first paper was rather the selection of such a meridian for this continent as would lessen, to the greatest degree, the inconveniences that will necessarily follow to certain individuals from this change. It was not intended to imply a doubt that some meridian would be adopted. I could not have imagined that it was the design of Congress to suffer our geographical positions to remain any longer in their present confusion; to continue to leave it to the discretion of the Superintendent of the Coast Survey to lay down the longitudes on the government charts from New York City Hall, or from Washington, as the necessities or conveniences of the work might decide; or to deprive our astronomers of the advantage — an advantage in some cases indispensable to the worth of their observations — of having the standard by which the times of these observations are regulated, and with which their results are compared, established on this continent. Indeed, on this subject the Congress of the United States has once expressed a clear and decided opinion. "Situated as we are," says the committee on Lambert's memorial, "in this western hemisphere, more than three thousand miles from any fixed or known meridian, it would be proper in a national point of view to establish a first meridian for ourselves; and measures should be taken for the eventual establishment of such a meridian in the United States. In examining the maps and charts of the United States and the particular States, or their seacoasts, which have been published in this country, the committee find that the publishers have assumed different places in the United States as first meridians. This creates confusion, and renders it difficult, without considerable calculation, to ascertain the relative situation of places in this country." The late Dr. Bowditch, writing against the adoption of an American meridian in 1810, which at that time was certainly premature, and which was then advocated upon insufficient grounds, said, — " The most effectual way of doing it," (establishing an American meridian,) "would be to erect a national observatory, and to calculate and publish annually a national almanac adapted to that meridian." In the same paper he urges the survey of the coast of the United States as the first and most important scientific enterprise to be undertaken by the government. The survey of the coast has been in successful and uninterrupted operation for eighteen years, a national observatory has been erected, and has now laid a foundation, broad and deep, of usefulness and honor, and, lastly, the calculation of a national almanac has been commenced. Already, then, in the language of the committee, "measures have been taken for the eventual establishment of a meridian in the United States"; and "the most effectual way of doing it," pointed out by our late eminent mathematician, Dr. Bowditch, has been entered upon, and will, I hope, be diligently pursued.

But the manner in which this question is to be treated is unexpectedly changed. I have not now to consider what meridian it would be best for us to adopt, but whether it is desirable to have any prime meridian on this continent at all. It is proposed that we shall continue to reckon our longitudes from an inaccessible and indeterminate point, distant three thousand miles from our shores, and separated from us by an ocean. It is gravely proposed that we shall compute our astronomical ephemeris for the convenience of an observatory which computes every year a complete ephemeris for itself, and between which and our own there is an interval of more than five hours of time. And these propositions come from sources too respectable to be disregarded.

The object of this paper must be, then, to show the importance and convenience of an American prime meridian.

There are three classes of persons to whom this subject is one of special and daily interest, — astronomers, geographers, (in which two classes I mean to include topographical surveyors,) and navigators, — and it is in its relation to their several wants and pursuits that I propose to consider this question.

The use of an ephemeris to astronomers consists in predicting the times at which the celestial phenomena they wish to observe will occur, in furnishing the elements upon which their calculations are based, and in supplying a fixed and accurate standard with which their results may be compared. The astronomical ephemeris predicts the occurrence of the phenomena for the time of that meridian to which it is adapted, or, in other words, for which it has been computed. If this meridian is distant, that is, if the time given in the ephemeris is widely different from the actual time of the observer, he is subjected to a real practical inconvenience in making the necessary allowances for ascertaining the period when the event he is to observe and record will occur with himself. If, on the other hand, he is supplied with an ephemeris which predicts the event in nearly his own time, he is relieved from this inconvenience in a great degree. I do not present this inconvenience as one that is serious in its nature, but as one that is serious and troublesome from its constant recurrence. It is felt because it is always present, and is like similar inconveniences in common life, that annoy less by their importance than by the frequent interruption they occasion.

When the astronomer has recorded his observation, he returns to the ephemeris for those elements of calculation by which it is to be reduced, by which its meaning is to be interpreted, or it is to be made available for practical purposes. These elements, also, are given for the date of that meridian to which the calculations of the ephemeris are adapted. But they are perpetually changing, and the changes are not uniform according to the time. It therefore makes an important difference to the astronomer whether they are given to him for a time near the moment of his observation, or whether they are given to him for a time between which and his own there is a large interval. In the latter case, he has to prepare them for his own use by a process (of interpolation) which is tedious, which requires calculation, and is therefore liable to error, and which, even with the utmost attainable accuracy, is only an approximation to the truth, and an approximation the more remote the greater the interval of time. In the former case, the process is more simple, less laborious, and consequently more free from this source of error.

But of the observations which the astronomer is called on to make, there are (among others) three which involve the problem of the longitude, the value of which is essentially affected by the situation of the observatory for which his ephemeris is computed. These are moon-and-star culminations, occultations, and solar eclipses.

The first is "one of the simplest and best astronomical means of determining longitudes for geographical purposes. But the accuracy of this method will depend upon the uniformity of the moon's hourly variation in right ascension; and this uniformity of rate will be greater, the smaller the difference of time between the first meridian for which the culminations are registered in the almanac, and the place where the longitude is to be observed. Now, the interval of time between the Greenwich meridian and the various parts of our country is from five to eight hours; whereas the interval between the meridian of Washington and the extreme parts of Oregon will be little more than three hours, and for the whole Atlantic coast only a few minutes. For nearly all parts of the States this side of the Mississippi, the difference of time will not exceed an hour." *

The next method in value is the occultations of planets and fixed stars by the moon. The nature of the calculation by which this problem is solved is such, that an error in the distance of the moon from the earth is multiplied twenty-five times in the result. But this distance is, in proportion to the whole amount of change, one of the most variable, and most irregular in its differences, of all the elements given in the almanac. It will be seen, therefore, that it is of the last importance to the use and value of this mode of determining longitudes, that the standard observatory at which these events are recorded, and with the predictions of which the results of the practical astronomer must be finally compared in order to deduce the longitude, should be

---

* Professor Coaklay's Letter on the Prime Meridian.

the nearest possible. But besides this, owing to the distance of Greenwich, the occultations visible there will not usually be seen here, or, if seen, will be of less value for longitudes ; and on this account the occultations of planets and fixed stars visible in this country have been computed by Mr. Downes of Philadelphia for the time of the Washington Observatory, and published in the Smithsonian Contributions. The phases, also, of the solar and lunar eclipses, the elements for facilitating the calculation of occultations which may be visible in the United States, the eclipses of Jupiter's satellites, the position and magnitude of the rings of Saturn, the phases of the moon, the general phenomena and observations, &c., are given for mean time of Washington in the American Almanac.* These are practical acknowledgments of the necessity for computing our almanac for a meridian on this continent, if we mean it shall be of any peculiar service to American astronomers.

The third method of determining geographical longitudes of which I have spoken is that of solar eclipses. This method is also so complicated, and embraces so many of the irregularly mutable elements of calculation, that it can be regarded only as an approximate means of determination where the standard registry of the event, or the observatory for the date of which it is recorded, is distant by any great interval of time from the observer. Indeed, the same reasoning applies to this as to the occultations, it being a phenomenon of the same character, with the addition of the uncertainty of the sun's elements of magnitude and position.

---

* *The American Almanac and Repository of Useful Knowledge* is here referred to.

These last two methods, indeed, are inadequate to the determination of differences of longitude between this country and Europe, and must, in the opinion of able geometers, be reserved for the correction of the lunar theory, when that longitude is better known. If, however, through the aid of the observations made at the national observatory, our nautical almanac is adapted to an American meridian, solar eclipses and occultations can and will be advantageously employed in this country for the determination of longitudes.

Thus it appears that the American astronomer is to derive essential benefit from the establishment of an American prime meridian; that by it he is to gain greatly in regard to the convenience and accuracy of his observations.

But how much is the cogency of this argument in favor of the meridian increased, by the nature and condition of this continent, which, in its vast extent of unknown and unsettled territory, is to afford for a century to come an ample field of research and enterprise to the explorer, the traveller, the surveyor, and (under all of which titles he is included) the practical astronomer!

But the importance of the prime meridian to the inland surveyor, to the geographer, and to the Coast Survey of the United States, is even more striking, as will appear both from the reasoning and the facts.

We are now engaged in a survey of our coast, which is conducted with the utmost precision that mature skill and profound science can insure. The base apparatus of the Coast Survey is so delicate an instrument, that the difference in two successive measurements of the same line, seven miles in length, will not probably exceed the half of an inch; and the main triangulation is carried on with such care and nicety, that the relative distances of its most remote points are ascertained to the fraction of a foot. Its other operations are performed with a corresponding accuracy. In supplying the means for the outfit and management of this national undertaking, the government has displayed the utmost liberality. The skill of the best European artists has been employed to construct its instruments, and the science of the most learned geometers has contributed to perfect its methods; and I am happy to add, that, in this latter respect, the talent which has been received has not been hidden in the ground, but rather returned with usury.

But to what end is all this accuracy, if, after it is attained, we are to introduce into the work an error not constant, but an error fluctuating and inconstant, by the use of longitudes counted from a distant and inaccessible meridian? Why, at great cost, and with great expenditure of time and labor, should we establish the relative distances of places on our coast with a refinement which does not neglect inches in the results, and then give to these places denominations that imply an error of half a mile? I say of half a mile, because, since addressing my first letter on the subject of an American prime meridian to the Honorable Secretary of the Navy, this continent has been shifted with regard to Greenwich one half of a mile by the recent chronometric expedition to Liverpool. This course of proceeding is, in itself, not consistent. Either an American prime meridian is wanted, by means of which we may express the Coast Survey positions in terms of suitable exactness, or the great subtilties of the work are in a measure wasted. The refined and elaborate triangulation, — the careful and oft-repeated astronomical observations, into which American industry and genius have introduced such valuable improvements, — both of these, which (in conjunction with our national and other observatories,) have done so much to establish the national character for science abroad, and to elevate the national standard of science at home, demand that a point on this continent should be selected to which the results of the Coast Survey may be permanently and definitely referred; that the longitudes on its charts of our shores and their harbours should be put down in figures as true and unchangeable as the spaces they represent are well known and determinate. And to those who deny this reasoning it belongs to show, not by any misplaced mocks at national vanity, or complacent pretensions to a more expansive liberality, — not by considerations drawn from private calculations of profit and loss, or by objections founded on usage, (the hackneyed complaint of fear or self-interest against all change,) — but to show upon some general principle or argument why it is, in the nature of things, that we should continue to preserve on our government charts a known inaccuracy; why we should reject the experience and example of other nations in this matter; why, in short, when we have actually arrived at a correct knowledge of the *relative* longitudes of places along our coast, we should put that knowledge into a form of representation that is *absolutely* incorrect.

Such is the *reasoning* with regard to the Coast Survey; and what are the *facts?* The facts are in conformity with the reasoning. There *is* an American meridian upon the Coast Survey charts; a meridian adopted by Mr. Hassler, the late superintendent. "Having no other point within the limits of the survey astronomically determined, nor any fixed point in the United States from which the longitudes could be counted,"* he took the meridian of the city of New York, in the vicinity of which the Coast Survey commenced its operations. When the Survey gets farther south, the meridian of Washington may be adopted. The longitude from Greenwich is, to be sure, added to the charts. But the manner in which this is done is among the facts to be noted. It is not given upon the graduated heading of the chart, where longitudes belong; this place is occupied by the differences from the American meridian, which are fixed. But it is put down where it may be easily erased, as it necessarily must be occasionally, and altered to suit some new determination.

To enlarge upon these facts would add nothing to their significance. In proposing the adoption of an American meridian, I propose that that which is now done without authority shall be done under authority; that all further necessity for erasures and alterations on our government charts shall be removed; and that, instead of using an American meridian which Mr. Hassler selected to suit his own wants at that time, we use an American meridian which the government will select, and which will be the best adapted to answer the requisitions of all classes of the community.

From the survey of the coast let us pass to the topographical map of the interior, a work not yet begun, but which is not, I trust, to be much longer deferred. It has the same value for the West which the Coast Survey has for the East. The Atlantic States will not, after having profited so much by the latter, refuse their cordial support to the former. Every nation, as it has advanced in science, and particularly in the science of political economy, has executed such a work. The great topographical map of France stands forth as one of the noblest symbols of her civilization and learning. That of Great Britain, which is still in progress, is pointed to by her leading men of science as an enterprise that may challenge the respect of the world. The statesman will not undervalue the importance of such a work. And it becomes every day more needful, not only on account of the increased population of the West, but on account of the peculiar condition of our continent. As the population of the West advances, and new lands are reclaimed from the uncultivated districts, the means should be at hand to fix their boundaries and positions, and for this purpose the domain of a precise and complete geography should be carried to the farthest limit of settlement. This will be a work of considerable time and labor. There is, therefore, the more reason that it should be begun early, and no time could be more propitious than the present for laying its basis, whether done by the general government, or by the States individually. The invention of the magnetic telegraph has provided a mode of determining differences of longitude with a certainty never before attainable. The astronomical difference of longitude between any two places connected by the electro-magnetic telegraph may now be ascertained by telegraphic signals with a degree of precision of the same order as the difference of latitude. The invention of the zenith telescope, by Captain Talcott, has increased the facilities for the astronomical determination of latitudes. We have, then, the best means of executing the groundwork of this undertaking, by determining the latitudes and longitudes of the chief cities and country towns throughout the interior. As there is no uncertainty in the zero of latitudes, why should there be any in the zero of longitudes?

---

* Hassler's Report.

And here the reasoning applied to the triangulation of the Coast Survey is equally pertinent. It appears to be preposterous to measure differences of longitude with the magnetic telegraph to parts of an inch of space, and to thousandths of a second of time, and then to *cancel* the merit of the labor by giving to these longitudes a title that is essentially defective and subject to change. Yet this is to be the effect of retaining a foreign meridian as the zero of longitudes; or, in other words, of not establishing an American prime meridian on this continent.

And at this point it will not be unprofitable again to compare the facts with the reasoning, and to inquire into the practice of our geographers. I have already quoted the remark of the committee of Congress, that "in examining the maps and charts of the United States and the particular States, or their seacoasts, which have been published in this country, the committee find that the publishers have assumed different places in the United States as first meridians. This creates confusion," &c. It is not much otherwise now. Among the school and other atlases and maps for sale in the book-shops of Boston, some are adapted to the meridian of Greenwich, some to the meridians of Greenwich and Washington together, and some to the meridian of Washington alone. In New York and elsewhere, the same variety, of course, prevails. On the great State map of Massachusetts, Greenwich is taken as the prime meridian; the scale of this map is so large, that the recent change of half a mile in the longitude of Boston is equivalent to a change on the map of nearly a quarter of an inch. Governor Pownall's map of North America (1776) made Philadelphia the first meridian, "that," as the author says, "we may determine the difference of the longitude of places by mensuration, a method far excelling the best astronomical observations; and as we may be led into several errors by always reckoning from remote meridians." The example of Governor Pownall has been, since his time, repeatedly followed. I am not informed whether any maps adapted to the Philadelphia meridian are still in circulation.

It is not worth while, however, to go any further into this inquiry.

Notwithstanding these facts, it is asserted that the establishment of an American meridian will create confusion. It would seem rather to put an end to a confusion already existing, than to create it. It will substitute, for several meridians now in use in this country, a single meridian. It will introduce order and uniformity where disorder and disagreement now prevail, and supply the geographer with a settled standard of reference of longitudes, instead of leaving it to be a thing of his own selection. But these facts relating to the maps published in this country contain additional meaning. They show that the practice and need of the community are on this subject in advance of legislation; that, in advocating the adoption of a prime meridian on this continent, I am not endeavouring to lead the public mind in a new direction, but am following a direction already taken; not creating a new want, but giving expression to a necessity already acknowledged; not adding a superfluity, but aiming to supply an actual deficiency, and remedy a practical defect.

It will be insisted upon, that this practice of our geographers does not indicate a defect, but is a mere exhibition of national vanity, a weakness which the opponents of an American prime meridian think it their special duty to reprove. It is not, however, national vanity, but convenience and utility, which have led to placing on the maps of the country an American meridian. Without it, these maps would fail to give a distinct idea of the relative geographical positions of places on this continent.

Where a European meridian alone is employed, the mind receives a first impression of distances in degrees of longitude from Europe, and Europe only; a more careful examination is requisite to connect them with each other, or with any fixed point that the student may assume at pleasure. When, however, the longitudes are laid down from an American station, the positions of places relatively to each other and to this station are quickly perceived, and are fixed in the memory by constant observation. In fact, a map of any country is essentially defective without a national meridian. It does not give, in the fullest sense of the term, the geography of that country, but its geography referred by one of its measurements to the standard of another country. It is on this account, it is in order to supply that which is useful and convenient, to render their maps complete, that the geographers of this country have adapted their scales of longitude to the meridian of Washington.*

There is one objection to the establishment of a prime meridian upon this continent, which has great apparent weight, and gains assent without much inquiry. It is this, — that such a step would increase the number of standards for longitude now in use, which, on the contrary, it is desirable to reduce and simplify, by the adoption, with the agreement of all nations, of one general meridian for the world. In my former paper I did not neglect this view of the subject. And I will add to what I have there said, that the retention of the present meridian at this time will be the most effectual mode of excluding all action upon a general meridian hereafter. But I have shown in the preceding pages that not one, but two or more American meridians are now in actual use; one, at least, on the charts published by the government, and one on the maps published by individuals. This is the actual state of the matter. I have also shown, that the convenience of the astronomer, and the wants of the topographical and geodetic surveyor, require that the standard of comparison and place of prediction for one, and the zero of longitudes for the other, should be near and accessible.

---

* It may be mentioned, as an evidence of the propriety of graduating the maps of every country to a zero of longitudes within its confines, that D'Anville's atlas of China (1737) is adapted to Pekin, as a first meridian.

In speaking of a general meridian, the preference is given by one to the Peak of Teneriffe, by another to Iceland, by a third to the Cape of Good Hope, by a fourth to Ferro, &c. But it is worth while to consider, that there has been a time when most European nations counted their longitudes from the same point, and all from some point beyond their own borders; and that, as science has advanced, as observatories have been founded, hydrography improved, geographical positions more accurately determined, and national ephemerides published, each nation has removed its prime meridian within its own limits. Before the meridian of Greenwich was adopted by Flamsteed, the English counted from the meridian of Teneriffe.* Two years after his death a "New General Atlas" was published, adapted to the meridian of London, and even five years after his death appeared the "Atlas Maritimus et Commercialis," adapted to the same meridian.† The French formerly used Ferro, a meridian established by royal ordinance; they subsequently removed their origin of longitudes to Paris, where it still remains. The Spaniards and Germans once employed Teneriffe and Ferro; the former now reckon from Cadiz, and the ephemeris of the latter is computed for the meridian of Berlin. The Italian ephemeris is computed for the meridian of Milan. The simple recital of these facts, without the elaboration of argument, proves that in practice all nations have found it most convenient, and indeed indispensable, in order to retain on their maps that accuracy which they are able to reach in the field and in the closet, — to preserve unity of design, and an easy perception of the relations to each other of different parts of the same territory, — to count their longitudes from a determinate origin situated within their own boundaries.

---

* See Seller's Atlas.

† As late as 1803, "The American Pilot," a book of sailing directions for the sea-coast of North America, published in this country, gave the longitudes from London.

The Americans, says the *Encyclopædia Americana*, reckon their longitudes from Washington. "The English astronomers and geographers," says Sir John Herschel, "use the observatory at Greenwich for this station; foreigners, the principal observatories of their respective nations." And, allowing just weight to the reasons advanced for an American meridian in behalf of the astronomer, and surveyor or geographer, I do not think that it is going too far to say, that even if a common meridian *had* been agreed upon in Europe, a distinct meridian would still be needed in this hemisphere for astronomical and geographical purposes.

It has been asked, If the meridian of New Orleans and St. Louis, which I have proposed, should be adopted, and it should hereafter be found, (as no doubt it would,) that the point selected was not exactly ninety degrees from Greenwich, what becomes of the complementary relation for the sake of which I suggested that meridian? Either our own meridian would change, or it would not, it is argued. If it changed, our differences from the new meridian would be altered, and thus our longitudes be again thrown into the confusion and uncertainty that exist now; if it did not change, it would be no longer ninety degrees from Greenwich. The answer is, that I distinctly stated that this meridian was selected for the convenience of seafaring people only, to whom the changes spoken of are of little importance; and that the proposed circle was to remain stable and unalterable. Our meridian is not to fluctuate with regard to Greenwich, in obedience to future changes, but Greenwich is to fluctuate with regard to the American meridian. It is no longer to be said that this continent has been shifted half a mile to the east or west in respect to the opposite shores of the Atlantic, but the reverse. I am aware that it will appear a very startling proposition to those whose minds are controlled more by habits than principles of thought, that the meridian of Greenwich should be moved. But, laying aside all national preferences, and the prejudices of custom, why, let me inquire, (provided it appears otherwise desirable on general grounds of convenience and scientific accuracy,) should not the meridian of Greenwich change relatively to Washington, for example, as well as relatively to Paris? or why should Greenwich not alter with regard to Washington as well as Washington and Berlin with regard to Greenwich? This is an instance of the "idola specus."

And herein is comprised the very question at issue; that is, whether the stability of an American or a foreign meridian shall be secured. Whether we shall have a fixed position on this continent, in reference to which the longitudes of the nations on the other side of the ocean may vacillate, or whether our own longitudes shall remain permanently unsettled, in consequence of their depending upon an inaccessible, and therefore to us variable station.

If an American prime meridian be established by the authority of Congress, it is most probable that, in the progress of time, it will come to be employed by American navigators. This change will not be sudden and immediate, but slow and gradual. It is desirable that it should be so. The force of habit in some, and of prejudice in others, together with the vigorous opposition of the few who are to suffer a pecuniary loss by the change of meridian, and the substitution of an American almanac for their own reprint of the British, will delay the period of its general use at sea. This opposition already shows itself in the form of a remonstrance or petition against an American prime meridian, which has been very extensively and promiscuously circulated for signatures in Boston, New York, and elsewhere; and in other ways. It would be a sufficient reply to these objectors to say, that although an American meridian may be established by law, yet it does not therefore follow that either they, or the persons in their employment, are obliged to reckon from it on the sea. They will be as much at liberty then to keep to the present meridian, as they are now to use the French or Spanish, if they should happen for any reason to prefer them. The law will exercise no constraint in this matter. Those who have hitherto found it for their interest to do so, will be ready to continue the supply of charts and means of navigation adapted to the present standard. This view of the question has not probably escaped them. The strenuous efforts now making seem, then, to be dictated, not so much by a real conviction of the hazards and inconveniences threatened by the change, — which, if correctly stated, would effectually bar its application in nautical practice, — as by an unacknowledged apprehension, that, notwithstanding all their alarming predictions, the American would finally supersede the present meridian among our navigators. I attach but little importance to this result. It is the astronomer and geographer who are to profit by the American meridian. It promises no immediate advantage to the navigator. But I am to show that it will be no disadvantage to him, since its introduction into our books of navigation would probably follow at some future time upon its present adoption in astronomy and geography. In truth, I should fail to do justice to the subject, and, I may be allowed to add, to myself, if I omitted to notice some of the objections brought forward in the papers referred to. Having been twenty-five years in the navy, and not altogether idle during that time, I may, without pretension, advance my own opinions and experience in the art and practice of navigation.

And in the first place it should be distinctly stated, for the information of those who are not acquainted with the subject, that this change involves no new principle or idea in navigation, and no new form or method whatsoever. It is the more necessary to make this statement, because it has been peremptorily asserted, with some display of authority, that, "were a prime meridian to be established, the greatest confusion and perplexity would result to the navigator; all his old charts would become useless; all his calculations would have to be made by himself; and the tables of reckoning, so important to uninformed shipmasters, would be thrown aside. Longitudes could be compared with none but American vessels," &c.

I must contradict this. I must deny authoritatively, that the utility of the nautical charts now in use will be at all impaired by the proposed change; that the calculations of the navigator would have to be made by himself in any sense whatever differently from now; that any tables of reckoning are to be sacrificed; that longitudes could be compared with none but American vessels. It is not possible that a question of this importance is to be carried by such mistaken and exaggerated denunciations. To alter the meridian of a chart does not impair its utility; otherwise the modern French and old Spanish surveys, which enter largely into the composition of all our nautical charts, as do the English surveys into those of the French, would only be profitable to the people by whom they were made. Of the fifty-six tables in Bowditch's Navigator, (ninth edition,) but seven would require alteration, and when altered would have precisely the same value, neither more nor less, that they have now. Of these seven, five would be altered in the heading only, and one is, from its nature, variable. The problems of navigation would of course undergo no mathematical change whatever; some of the terms in which they are stated, and the examples by which they are illustrated, would be accommodated to the new meridian, without affecting in any way their character or value. As to exchanging longitudes with English vessels at sea, it would be attended with this difference, that when the longitudes are given, a *constant* quantity is to be applied to convert them into values of the other meridian. But it is affirmed, that this is a perplexing operation. It is no more perplexing or novel, than the adding or subtracting of degrees and minutes, which the navigator does every day of his life at sea; and it may have to be done once in a voyage, and even then may be of no importance.

The declarations made upon this subject of the interchange of longitudes at sea are, both in form and language, suited to produce the most erroneous impressions. It is almost made to appear that American vessels are habitually dependent upon those of the mother country for a knowledge of the longitude; that the former do not cross the water without this help. But such is not the case. American vessels go to sea amply provided with the means and the skill to determine their own positions, without assistance from any foreign vessels. Wanting such provision, they could not command an insurance. Occasionally it is found convenient, when they chance to fall in with other ships, to compare reckonings; but it is not saying too much in praise of American shipmasters to assert, that they rely, and rely safely, upon their own capacity and judgment. There is an object, however, on this occasion, in undervaluing this capacity, and I have even heard it asserted, in the discussions growing out of this question, that our merchant captains were the most incompetent and worst educated class of men in the community, and very inferior to the same class in other countries. This opinion is wholly at variance with the one which I had formed from professional intercourse. Lieutenant Maury, who, in the course of his investigations into the winds and currents of the ocean, has examined some ten thousand of their log-books, says of them, — "The commercial marine of no country in the world can boast of shipmasters superior to the Americans as navigators, and in general intelligence." The Report of the select committee of the House of Commons on shipwrecks says, that "the committee cannot conclude its labors without calling attention to the fact, that the ships of the United States of America frequenting the ports of England, are stated by several witnesses to be superior to those of a similar class amongst the ships of Great Britain, the commanders and officers being generally considered to be more competent as seamen and navigators, and more uniformly persons of education, than the commanders and officers of British ships of a similar size and class trading from England to America; that American ships sailing from Liverpool to New York have a preference over English vessels sailing to the same port, both as to freight and to rate of insurance." Language like this, coming from such a source, and no doubt well considered, would justify the inference, that, if there was any dependence in the case, it was on the other side. But even admitting all the force of the argument against the American merchant captains, I still maintain that the interchange of longitudes at sea presents no practical difficulty.

Again, it is said with truth, and this is the objection most pertinaciously urged, that this interchange may take place under circumstances of bad weather, darkness, haste, &c., which will preclude the possibility of knowing from which meridian the longitude is reported; and thus the vessel receiving it will be left in doubt and perplexity. This applies to English as well as American vessels, and in treating a question of this nature it would be altogether illiberal to limit our views to the wants of one people only; for commerce, in the service of which navigation is only a subsidiary art, embraces in its general scope the common good of all nations. Now this doubt and perplexity can only occur within a limited region. It is not possible, for example, that, if the longitudes of the two vessels differed by three or four degrees, according to their respective modes of counting, there would be any uncertainty as to which meridian was used by the reporting vessel. The present perfection of the instruments of navigation forbids such a supposition. Let two degrees be assumed as the limit of possible uncertainty. With the present means of safe navigation, not more than one vessel in fifty in crossing the Atlantic asks for the longitude absolutely requiring it, and of these, not more than one in one hundred will happen to ask for it in the uncertain region. Of these few it may be granted that one in ten is not informed from which meridian the longitude so communicated is given. Thus, one vessel in fifty thousand asking for the longitude in the uncertain region, being wholly ignorant of her own position, may fail to obtain the exact information needed. This will occur in the middle of the Atlantic, at a great distance from land, the near approach to which will consume several days of fast sailing. In this interval, not more than one in one hundred will be so unfortunate as to get no observation. But what shipmaster, who can command an insurance, would be so dull or careless, having this kind of doubt about his longitude, and being without observations, as to neglect the precaution of keeping his reckoning from both data? If we say one in one hundred, the proportion is reduced to one vessel in five hundred million, that would be likely to incur this danger upon which so much stress is laid. Finally, if it be gratuitously admitted that in every such instance the uncertainty is taken on the wrong side, and terminates in a loss of property, the additional risk upon a capital of one hundred millions of dollars resulting from this source of accident would be twenty cents!

But if we adopt the recommendation of Sir John Herschel, and count our longitudes from one, round by the west, to three hundred and sixty degrees, then the terms of the longitude counted from the two meridians would be so entirely dissimilar, as, on the Atlantic, never to be mistaken for each other. The region of uncertainty would be transferred to the Pacific Ocean, in a place so remote that it is hardly worth while to calculate the risk of an accident arising from the supposed perplexity.*

It is said, also, that if the numbers of the meridians on the charts were changed, the shipmaster would, in a manner, lose his place, by the loss of familiar objects; but as the meridian lines are not sensible boundaries on the ocean, I do not see the force of this objection. To say that the captain would be confused by such a change, is equivalent to saying that he can only navigate in one part of the world; for if he goes to other seas, he has to deal with different meridians. In sailing now from New York to Liverpool, the American navigator descends from 74° to 3° of longitude, and in returning he ascends from 3° to 74°, reversing the former process. If the meridian of Washington were placed upon our nautical charts, and the usual method of counting retained, the only difference to the navigator would be, that he would increase his numbers going east, and decrease them coming west, whereas he now decreases them going east, and increases them coming west.

---

* This would be the revival of a former custom. The old maps of Homaan and Calom give the longitudes in this way, counting from the Peak of Teneriffe.

Another mistaken notion upon this subject is, that the difference between the present and new meridians will constantly obtrude itself in practice ; that it will be always present in the calculations of the navigator, and that the reduction from one to the other will form a necessary part of his daily work. It is not so. If an American meridian comes into use at sea, the charts and books of navigation will be fully adapted to it, and the American navigator will have no more to do with the present meridian in his current reckoning, than he has now to do with the French and Spanish. He will neither see the old meridian on his charts, nor find it mentioned in his books; he would have no occasion to think of it, any more than he has now to think of the meridians of other nations; and these he only thinks of in those rare instances when he is about to transfer a longitude from foreign charts to his own.

The change from one meridian to another on a chart is represented to be a matter of great risk; an affair almost of life and death. Yet this change is effected by writing a few figures in pencil over the meridian lines at the head of the chart, and can be accomplished in the time employed in transcribing this sentence. It is not unusual to purchase abroad French and Spanish charts, if necessary, and the captain who ascribed the loss of his ship to the use of such a chart, because its first meridian differed from his own, would be listened to with contempt, and would certainly lose his insurance.

There is one inconvenience to the navigator arising from this change of custom, which its zealous opponents have overlooked; the mention of it may serve to show that I have not neglected the consideration of this part of the subject. The geographical positions of places lying in or near his usual route form a part of the seaman's familiar practical knowledge. They constitute a species of nomenclature by which these places are distinguished, and the idea of their relation to each other, and to his course on the ocean, is preserved in his mind. It would exercise his memory somewhat to learn the new longitudes; though, it may be added, if he only knew them when looking on the chart, his safety would not be diminished.

The foregoing remarks upon the use of the proposed meridian at sea are made to correct the erroneous impressions that have been circulated on this subject. They are not designed, as I said before, to show that the navigator is to reap any immediate benefit from the proposed change, which in his case, at any rate, will be distant and gradual, but to show that, if it does take place, and is introduced into nautical practice, as it eventually may be, no such evils are to follow as, without regard to truth, or without proper investigation, have been threatened.

But I do believe that an ultimate benefit will accrue to the navigating community by the adoption of an American prime meridian on the sea. I believe that the effect will be to create in the government a stronger sense of its responsibility with regard to the general advancement of hydrography; to induce it to contribute its fair portion of money and labor towards improving the safety of navigation, and completing the geography of the seas. The progress of science, and, consequently, of all useful arts immediately dependent on science, is promoted by unity of system, by the existence in every nation of a perfect organization, by creating national responsibility, and by encouraging an honorable pride in scientific enterprises and achievements. It is, however, in behalf of the astronomy and geography of the country that I have advocated the importance of an American prime meridian, which, when established, may be adopted by the navigator or not, as the character of his own mind, or the control of his owners, may direct. I do not venture to pursue this view of the subject, lest I should expose myself to still further attacks from those who have assailed my course in this matter, with more zeal than courtesy.

But upon this subject the power of declamation, as well as of reasoning, is brought to bear. It is incorrectly stated, in the memorial above referred to, that I suffered the proposed change to rest upon considerations in some way connected with our national independence. My language on this point is,—"Hitherto I have treated this question without an express reference to merely national views and feelings. *So far as the subject is merely scientific, they do not enter*; so far as it is practical, they are of paramount importance"; and the practical views, to the consideration of which the principal part of my former paper is devoted, are those which concern the navigator, and have been taken (without acknowledgment) to form the chief basis of the memorial. One would suppose that language so precise and explicit could hardly be perverted; but he who has been before the public, and not discovered that no exactness of speech affords a security against intentional misinterpretation designed for effect, may consider himself very fortunate. There is one point, however, upon which I incurred the danger of sneers and imputations on account of national feeling; and that is, the establishment of the almanac itself. I did say, "I indulge a sentiment of American pride and gratification, that another step has been taken by the government towards the promotion of science by the foundation of an American nautical almanac." So far as this sentiment is open to attack, I have exposed myself. But I have yet to learn why a national feeling upon this branch of American labor, the labor of the mind, is more offensive than upon any other branch of American labor; or why it is more a peculiar mark of national vanity to be pleased with national progress in science, than with national progress in other paths of distinction and usefulness. Intellectual independence is as precious to those engaged in the pursuits of knowledge, as another sort of independence is to those engaged in the pursuits of business. It is equally necessary as a stimulus and an encouragement to exertion. It is also no less important as a security for enjoying the fruits of one's own labor. Sir John Herschel, in a recent address before the Royal Astronomical Society, said, — "The filling up of the great outline struck by Newton with the analytical expression of the laws of lunar and planetary motion, we owe to other nations, especially to the French. We grudge them not this glory. They have fairly won it, and it is theirs. But the broad basis of observation upon which this magnificent structure has been raised is British; essentially, thoroughly, and *nationally*" (the Italics are in the original) "British."

Perhaps with this authority I shall be more easily pardoned by some persons for indulging an *American* feeling upon the foundation of a national ephemeris. But an ephemeris computed to the English meridian is not an American ephemeris, but an English ephemeris computed in this country. It is to be doubted whether these misapplied sneers at national feeling will have much weight with Congress.

It is said that we might as well change our language, as cease to count our longitudes from the present meridian. This is either a mere rhetorical flourish, or it means that the meridian and the language invariably go together. But the Danish and Russian navigators, having no almanac of their own, must make use of a foreign almanac outside of the Baltic. It appears from this that the language and meridian do not necessarily go together. At the same time it is quite certain, that, if these Northern nations published an ephemeris of their own, they would employ that rather than the British. And, moreover, will the language and the meridian accord less with each other than at present, if a meridian should be established on this continent?

It is said that "the same principle of an ideal independence, which will require us to abandon the meridian of Greenwich, must require us to abandon most of our instruments of art, science, and literature,"

&c. Supposing that the writer of this sentence had any distinct idea in his own mind, (a supposition very possibly erroneous,) he means to say one of two things; either that we might as well abandon the principles upon which these instruments as inventions rest, and devise new inventions for ourselves, or that we might as well cease to employ instruments of English manufacture, the productions of English workshops. But the first assumption is manifestly absurd; for in proposing to count our longitudes from a known and fixed station on this continent, instead of an unknown and unsettled station on the other side of the Atlantic, we do not abandon the idea on which the use of a prime meridian is based, but, on the contrary, assert the more strongly its fundamental importance. In changing our prime meridian, we are not deserting a principle, but modifying a practice. And with regard to the second assumption, it is doubtful whether the boldness or the absurdity of it is most to be admired, coming, as it probably does, from one who keeps for sale charts, books of navigation, compasses, sextants, &c., professedly of his own construction.

We have already partially abandoned the use of English telescopes, theodolites, sextants, microscopes, and meridian transits. We have introduced into our observatories German telescopes and circles. We have even abandoned, in some measure, that exclusive devotion to the science of the mother country which once prevailed. It is well known that the *American* books of mathematical and physical science, (now chiefly employed in our institutions for education,) are quite original, or much more Continental than English, in their plan and principles. We have even gone so far as to make some new inventions of our own. But I need not prosecute this examination any farther; enough has been said to show the utter fallacy of the writer's argument, which, as is not uncommon with arguments proceeding from such motives, overleaps itself, and falls into absurdity.

A great deal of this kind of reasoning is intended to show that we have a right to claim the meridian of Greenwich as our own, and therefore ought not to attempt a change. But it is not the question, whether we may or may not regard that meridian as essentially American, no less than English. The question is, whether, having a national observatory, and being about to publish a national ephemeris, or (in the words of the late Dr. Bowditch) having adopted "the most effectual way of doing it," we find sufficient inducements of a practical and scientific nature for establishing an American prime meridian. This is the real question, and the only question. It is the one I have treated in the former part of this paper. The statements I there make concerning its value in astronomical and topographical respects are true. They are opposed, no doubt, to the interests and prejudices of certain people, who may possess influence enough to cause their rejection. In consequence of the vigorous opposition of the authors of the memorial, the reasons I have brought forward may lose their apparent validity; but they cannot be deprived by any show of names of their intrinsic truth and value.

But there is another argument which is best characterized as the sentimental argument. "We were in our father's loins when they established it," says one writer, in a paper against the prime meridian. "It is ours, as are King Alfred and Shakspeare." The

Greenwich meridian was probably first designated (not brought into general use) by Flamsteed somewhere between 1675, the date of his appointment as astronomer to the king, and 1719, the year of his death. I shall not be obliged to remind the reader of the period when the reign of Alfred ceased, or that of Shakspeare began. This reasoning seems to be as little luminous in the association of ideas, as in the chronological connection. The present meridian is not ours, in the sense that King Alfred and Shakspeare are ours, any more than are the currency and standards of weight and measure, or form of government, of Great Britain. But "we were in our father's loins when they established it," exclaims the writer. So also were we in our father's loins when the first Nautical Almanac was published, in 1766; are we, therefore, to have no almanac of our own? We were in our father's loins when that famous navigator, Anson, near the middle of the last century, recorded his longitudes from London, and the Lizard. We were in our father's loins when they counted from the Peak of Teneriffe. And, "not to crack the wind of the poor phrase," we were in our father's loins when (in 1721) it was written concerning their first meridian,—"Our English geographers, as Cambden, Speed, and others, fix it in the Azores Islands; some at the island of Corvo; and others, which is most followed, at the Isle of St. Michael's; and later ones place it at London." * The connection between our father's loins and the meridian circle, or between the zero of longitudes and good King Alfred, or the immortal drama-

---

* Atlas Maritimus et Commercialis. Preface.

tist, will not probably be as palpable to every one as to this enthusiastic declaimer. This sort of declamation, on a matter of scientific and [practical interest, serves at least to show out of what shreds and patches of thought a moderately ingenious mind, when hard pushed, can construct an argument, — an argument that bears the same proportion to strict ratiocination, that a toy does to a real implement of art.

Such language is mischievous, as well as unsuitable. It introduces national feelings, and rouses national prejudices. It appeals, on the one hand, to those sentiments of respect and regard for the authority and usages of the mother country which, especially in the present state of the world, every good man will desire to preserve and cultivate as far (on this side of subserviency) as it is possible to go; on the other hand, it revives the painful feelings which occasional acts of literary and scientific injustice have naturally excited. These expressions, and others similar to them in the memorial, incur the rebuke of the late Dr. Bowditch, by the "introduction of national prejudices in matters of science, which cannot be too much reprobated."

The obtrusion of merely personal views is no less to be condemned than that of national prejudices. It is undoubtedly true that such a change as the one proposed must involve some personal inconveniences, whenever made. They are unavoidable; but they constitute in themselves no argument against the change. The objections growing out of them are incidental to the question, not inherent in it. They are objections of expediency, not of principle.

In the treatment of a question like this, it is necessary to distinguish between circumstances that are variable and peculiar, and principles that are permanent and general. The former may be so prominent and importunate as to overshadow and conceal the latter. The reasons for having a prime meridian somewhere on this continent, established by law, are founded on principles of science. The objections to it arise chiefly from the real or fancied wants of those who, fearing that, if it be so established, it will finally be used at sea, apprehend some disadvantage from that result. But it is to be hoped that, in the discussion of this subject, objections springing from such a source will be allowed to have no more than their just influence, however forcibly they may be urged, and however formidable the array of names by which they are represented; that in weighing these objections the truth will be separated from the error, and the private wishes of individuals from the public demands of the country.

In bringing forward the subject of an American prime meridian, I performed a duty belonging to my office; and though I did it in language which, morally at least, was inoffensive and irreproachable, I have not escaped some sneers and imputations on the part of its zealous opponents, proceeding sometimes from the pertness of ignorance, and sometimes from the solicitude of self-interest. So far as these opponents have suffered themselves to be betrayed into a violation of truth and courtesy, they may unguardedly have injured their own cause. But having myself nothing either to gain or lose by the ultimate decision, and being only actuated by a desire for the advancement of truth and the promotion of American science, it costs me nothing to pass their remarks by without further regard.